

Brainard (D.)

REPORT ON SURGERY.

(Made to the Illinois State Medical Society, at its Annual Meeting, May, 1860.)

BY DANIEL BRAINARD, M. D.,

Chairman of the Committee, and late President of the Society, &c.

PART FIRST.

I. *Ununited Fracture.*

In the year 1854, I published a brief Essay on the "Treatment of Ununited Fracture."

The object of that publication was to present the subject in a new point of view and to study those cases, so diverse in character, so deficient in treatment, by the light of Physiology alone. In so doing, experience was neglected for the moment, for the purpose of deducing certain principles of treatment from experiment and from physiological facts already established. The treatment proposed has been favorably received by the Surgeons of this country, and considering the manner in which it has been applied, the results have been altogether as successful as could have been expected. The principles upon which it is founded have not, however, been always studied, and consequently it has often been applied in a manner or under circumstances in which it was little likely to be successful.

I propose to re-state briefly these facts and those principles, and add to what has been heretofore published on the subject, the results of my own experience up to the present time.

The points of importance in the plan of treatment proposed

1. The operation, whenever practicable, should be *subcutaneous*. The peculiarities and advantages of the application of this principle to Surgery had been already so fully established by John Hunter, that in proposing its application to the bones, it was not deemed necessary to go into any general statements of its advantages. Facts of physiology were, however, adduced to show that callus is more easily formed in subcutaneous than in open wounds of bone. Surgical observation had already sufficiently demonstrated that the former were

greatly less dangerous than the latter. But the application of the subcutaneous plan to the bones involved the question of the value of several methods of treatment in general, and especially those of seton, ivory pegs and resection. Accordingly I was led to state as the result of experiment, that

2. The presence of a foreign body of any kind in contact with a bone or between its fractured ends, has in itself no tendency to induce the formation of callus; but that, on the contrary, it pretty uniformly causes absorption of the bone, and not unfrequently gives rise to extensive suppuration, necrosis, etc. No one that I know has ventured to call in question the accuracy of these statements, and they seem to be of sufficient importance to deserve to be recalled to the attention of Surgeons.

3. I ventured in the Essay referred to, to insist upon the importance of extensive, deep, and in some cases, of repeated wounding of the bone as essential to success. The failure to note and apply this precept, has been the apparent cause of failure in most of the cases, in which complaint has been made of want of success. In many of these, the instrument used was a gimlet, trochar, "strong needle," etc., with which the bone, when compact, cannot be sufficiently wounded, and with which, the injury of the soft parts is such as to endanger the production of suppuration.

The rules which I have laid down, and which will in my view, render the treatment of united fracture by subcutaneous division of *the bone* as well as of the soft parts, generally safe and effectual, were as follows:

1. To use in the beginning an instrument of small size, and make not more than three perforations in the bone and but a single puncture in the skin.

2. Repeat the operation; gradually increasing the extent of wound of the bone by using a large sized instrument or increasing the number of perforations, or both, every eight or ten days until tenderness, some pain and heat, were induced. This should be kept up for some time. In favorable cases, a single operation has proved successful. In others, as many as four, six, or even eight, have been required.

3. Avoid the course of vessels and veins as much as possible ; use compression over the point of puncture to prevent subcutaneous hemorrhage.

4. Make use of such diet and constitutional treatment as may be indicated, and such splints and other dressing as may be best calculated to preserve immobility.

By following these rules, I have been able to succeed in procuring union in sixteen out of seventeen cases of ununited fracture or delayed union, which I have treated by this method. In one case it failed, as did also the seton and resection. This case was cured about three years after the fracture, by fixing the fragments together with iron wire. One case left while under treatment, and in what appeared to be a favorable way for union, to be placed under the care of another Surgeon, who, I was informed, used the seton without success.

I have in addition, treated two cases of ununited fracture of the femur, by fixing the ends of bone together with metallic substance. Both were successful, but were attended with such extensive suppuration as to render the danger of the operation obvious, I therefore do not recommend its use, except when other and milder means have been tried without success.

I have performed amputation for ununited fracture twice. In both, the member was not in a condition to be useful if union could have been obtained. In one there was paralysis, in the other extensive loss of substance from sloughing.

In order to give a fuller view of the subject, it may not be out of place here to present the views of authors in regard to the treatment of these cases.

1. Malgaigne, in his standard work on fractures, directs, in cases of delay of union of fracture, the use of proper means of approximating the fragments, securing the immobility of the member, exciting the vitality of the parts by local applications, and in case of need, using such constitutional remedies as may be indicated. The value of these means does not admit of question ; but they should be applied with discrimination, and not allowed to take the place of other treatment after a certain length of time.

Of the operations resorted to, M. Malgaigne enumerates rubbing the fractured ends together, use of acupuncture needles, seton, ligature, resection, abrasion of the fragments, and cauterization.

He does not absolutely condemn any, but leans to the use of those which do not give rise to suppuration, except in extreme cases, when he advises resection and the suture of the fragments, which, he adds, "I consider a real progress."

Dr. Hamilton, in his recent work on fractures, after advising the preliminary measures recommended by Malgaigne, advises of operations "the practice recommended by Brainard, namely, perforation of the soft parts and bone with an awl." "If in the lower extremity, allow the patient to walk about after the plan of White or Smith."

"If the fracture is not in the femur, and as an extreme measure, employ the seton." "Resection is applicable only to superficial bones, and in cases of overlapping."

Norris, in his complete and valuable essay on the subject, recommends—

1. Rest and compression.
2. Where these are insufficient, use blisters, moxas, iodine or other stimulants, to the seat of fracture.
3. If these fail, employ frictions.
4. If these are insufficient, or if the fracture be already of eight or ten months' standing, resort to the seton.
5. If this also be insufficient, or if the situation of the fracture forbid its use, expose the fracture and apply caustic potash.
6. Resect the ends of the bones.
7. Amputation, if the member be useless, and the patient desire it.

Dr. Hamilton limits the application of resection to those cases where the fragments overlap. This is not an absolute rule, for in the femur and humerus, and where both bones of the leg or fore-arm are to be operated on, it is not difficult to approximate the cut surfaces after resection by pressure. It is probable that taking care not to remove the periosteum along with the bone, might be a useful precaution in this operation.

How long after a fracture which does not unite, ought any operation to be deferred? This is a question to which no answer applicable to all cases can be given. Where there is partial union, we may expect it to be perfected by continual rest in splints. When proper treatment has not been used, we might anticipate more benefit from the use of suitable dressings, than when these have already been applied. The difficulty of producing union, is in direct proportion to the length of time which has elapsed since the fracture. In order to not incur any risk, which can be prudently avoided, I generally resort to puncture, in from twelve to sixteen weeks, unless union should be taking place without interference. I have, however, found only two cases under my own care, from the time of the accident in which any operation was necessary, and these readily re-united by puncture.

There are some cases in which no attempt to procure union need be made. These are when perfect paralysis exists, where the soft parts are so much injured as to render the member useless. These are cases for amputation. I have performed it for one of each. I have a specimen in my cabinet presented by Prof. Middleton Goldsmith, of Louisville, procured from a case in which amputation had been performed, showing the bone (lower end of the femur), so much softened that it can be easily disintegrated with the fingers. In a case of this kind, if it could be ascertained, no operation would promise benefit. It is, however, the only case or specimen which I have met with, where much alteration of the structure of the bone was proved to exist.

There are some cases where the state of the health is such as to contra-indicate any operation, such as the existence of tubercle cancer, acute and chronic diseases of a grave character, scarlatina, and all those alterations denominated *dyscrasias*, if existing in a great degree, even pregnancy would render advisable a delay, or an abandonment of all serious operations. In old cases, where the use of mechanical supports renders a member considerably useful, it would be better to be content without further interference.

The practice which I am in the habit of adopting, when a case of united fracture presents itself to me, is as follows :

1. Search for the cause of the failure to unite. If it be found in any constitutional condition, such as pregnancy, phosphatic deposits in the urine, scorbutis, etc., which is very rarely the case, such state should receive the appropriate treatment.

2. If, as happens most commonly, it has resulted from imperfect apposition, insufficient dressings, or too much motion, and the dates only twelve, or in some cases sixteen weeks, I endeavor to remedy and prevent the recurrence of these difficulties, by the means best adapted to each particular case. If more than sixteen weeks has elapsed, or, where there is no thickening of the tissues about the seat of fracture, twelve weeks, I conjoin perforating according to the method already indicated, and careful dressing with splints,* If this plan after preserving trial for three or four months, gives no evidence of success, I resort either to the seton or re-section with the wire ligature. To the seton if the fracture be of *one* only of the bones of the fore-arm, or of the leg; to exsection if it be of the femur or humerus. The wire may be passed through the perforations of the bone, made from an incision on each side, when this can be done most readily, but there is danger of its becoming fixed in the bone if allowed to remain long.

This re-section with the wire suture is so precious a resource, that in addition to my own experience, (success in three cases,) in one of which every known method had failed, I add respecting it, in part the words of Malgaigne, " In certain cases of overlapping of the fragments, and particularly when they are separated and movable in the tissues, exsection seems to me the only rational resource joining to it, the suture of the fragments, which I call a veritable progress. I have seen three very old fractures of the humerus not united, which I did not even think of treating, so discouraging was the mobility of

* **NOTE.**—When the perforations had little effect in inducing tenderness and thickening of the tissue, I am in the habit of leaving the instrument inserted in or between the bones, until pain and tenderness are produced, but not long enough to give rise to suppuration. I have not left the instrument in place more than a few hours. but should not hesitate to do so for two or three days if necessary, unless inflammation supervene sooner.

the fragments. With the suture, I should not at present hesitate. (*Traite Des Fractures*, p. 323.)

In regard to the means to be resorted to in any particular case of non-union, they cannot be determined beforehand. The subject is complex and requires to be considered in all its parts before laying down rules of general application.

Firstly, let us consider for a moment the nature of the various operative plans proposed.

1. Rubbing the fragments together, said to have been proposed by Celsus, has often been resorted to, and numerous cases are to be found on record in which it has proved successful.— Yet a careful consideration of the subject, will show it of limited applicability, if not of doubtful utility. It is evident, that in all fractures of the clavicle, of one of the bones of the leg or fore-arm, it can not be done to any considerable extent. In fractures of the lower jaw and those of the femur, it will be found difficult. Those of the humerus alone remain. Since too great mobility is one of the most frequent causes of non-union, it would be unwise to resort to it in such a way as to destroy adhesions which may have taken place between the fragments. Finally, in old cases with much mobility, little could be expected from it.

Secondly. The seton proposed by Dr. Physick acts upon the same principle, and is applicable to nearly the same cases as the ivory pegs of Dieffenbach, the introduction of wire around the fibrous tissue between the bones, etc. The pegs, however, may be applied upon one side of the member, which is a great advantage in some cases. All of these plans are open to the objection of being dangerous, and converting a simple into a compound fracture. I have shown that they have no tendency to produce callus, but rather to cause its absorption. Dr. Physick himself, according to Norris and Gibson, advised against its use in fractures of the femur. Recent writers have adopted this view. I think, in view of its severity, it should not be preferred in recent cases, and that there is little prospect of success in very old cases. When the fragments are not in contact, it is useless. Where other means have failed, and all hopes of union has not been abandoned, the seton should

be tried when it is not required to be passed deeply through the soft parts. When it is used, I think passing it between the ends of the bone, and allowing it to remain for several months, if not successful before, as was done by Dr. Physick, is most likely to prove successful. It is certain that the seton is less used at present than several years ago. Dr. Norris thinks the little favor it met with in Europe, is due to national prejudice. It is probable, however, that its use in fracture of the thigh, and in very hopeless cases, has contributed to this result, for we find it tried by Sir Charles Bell, Wardrop, Brodie, Cooper, and others equally eminent in England; and in France, the merit of its first proposal was divided between Percy and Physick.

Thirdly, Resection of the extremities has generally been regarded as the last resort prior to amputation. Cutting down and dividing the bone, applying the caustic, may be ranked with it in point of severity and advantages. It is applicable to those cases in which some soft tissue intervenes between the bones. When employed, I think that the ends of the bone should *always* be fixed together with wire.

II. *Treatment of Angularity of the Bone after Fracture and Anchylosis.*

Along with the essay on the treatment of Ununited Fracture, I published a proposal for treating certain deformities of the osseous system by a new method.

The deformities referred to, are mal-position after union from fracture, and anchylosis, and the method proposed consists in weakening the bone by subcutaneous partial division, so as to allow it to fracture more readily, or to bend by gradual pressure after the tissue of the bone shall have become softened by the effect of the wound.

At that time, I had only made use of this treatment on the bones of dogs. At present, it has been employed in five cases on the human subject, in four of which it has been successful, and in the other where it was resorted to by Prof. Pancoast, it is supposed to have succeeded, although, I have not noticed any report of the result.

As this method of treating these cases is new, and not always resorted to where it is well adapted, it may not be amiss to sum up here the results of experience thus far, and to point out more clearly than has yet been done, the relations which it bears to methods heretofore in use, and the conditions in which it is likely to prove successful.

The first case in which it was resorted to, was that of a boy three years old, who had received a fracture of both bones of the leg when an infant, on whom I operated May 15, 1858. The deformity was so great as to render the member quite useless. The callus at the point of fracture of the tibia was perforated in two different directions, with an instrument the point of which was one-fourth of an inch in breadth. Efforts were then made to fracture the bone, but without success, and the patient was left ten days at rest, with cold water applied at times, until the inflammation, produced by the operation and efforts at fracture, had subsided. Gradual pressure was then made by means of a straight splint, with a foot-piece applied behind the leg, and a roller passed around the most projecting point of the angularity. In four weeks the member was quite straight, except a projection not considerable, resulting from the overlapping of the fragments. In eight weeks the boy was able to walk with a useful member. This case was reported in the Chicago Medical Journal for January, 1859.

The second case occurred in the fracture of Prof. Paul F. Eve, and was noticed in the Nashville Medical Journal for March, 1859.

The fracture was of six years date, of the tibia and fibula, in a boy ten years old. "Placed under chloroform and ether, with a brad-awl the tibia and fibula were several times perforated through one opening made in the skin, and the bones re-fractured by the hands. The larger bone yielded readily, but the smaller one was not sufficiently divided." "Owing to the severity of the operation and the free use of anesthetic agents, we desisted for the time. Ten days afterwards, the fibula was again attacked by the awl, and the limb brought perfectly straight. It was now placed in a fracture box, extension and counter extension maintained as usual, and a weight—a pound

of shot in a bag—retained over the point where the angle existed.” I afterwards learned from Prof. Eve that his patient recovered with a straight leg.

The third case was by Prof. Pancoast, and noticed in the Med. and Surgical Reporter for March, 1859. It was one of ankylosis of the knee, in which extension had been tried. The operation is thus described:—“It is proposed to-day to bore holes in the bone from one external orifice in the soft parts above the knee, where the bone is least covered, and after having thus weakened the part sufficiently, to break the bone either across the knee or by apparatus.” “From a single external orifice a half-a-dozen holes were bored through the bone, and after several efforts to break the bone, it was fractured with a loud crack, distinctly audible over the whole room.” The instrument employed by Prof. Pancoast was a gimlet, and he remarked that the operation was dangerous, but less so than that of cutting out a V shaped piece, which is “extremely hazardous.” The case was exhibited at the following Clinic, no unfavorable symptoms having followed the operation.

Since writing the foregoing the following letter has been received from Prof. Pancoast, in reply to enquiries I had made. The result shows that the gimblet is not free from objections

PHILADELPHIA, May 8, 1860.

My dear Sir:—

The result in the case of the lad, whose thigh bone I fractured after perforation, on account of ankylosis of the knee, with the leg in a flexed position, has been good. He is now running about the town, and I exhibited him to our class this winter. The foot comes well down to the ground, and the limb is almost as straight as is desirable in these cases where the knee joint is stiff.

The bone at the point of fracture forms an angle, with the apex projecting into the ham. But this projecting apex in no wise interferes with the vessels or nerves of this region. I should have had even a better result in the case, if the constitution of the lad had not been so weak and scrofulous.

After he had been taken home from the college hospital by his parents, a large abscess formed about the fracture, which was evacuated by a puncture on the side of the thigh. This was owing, I think, to the inattention and poverty of his parents; for after these causes had been provided against, the case which after the formation of the abscess had rendered me anxious, went on

well. I was obliged, however, to content myself with a less complete effacement of the angularity at the knee, than would otherwise have been necessary. I was led to this operation (forgetful at the time of what you had written on the subject, though subsequently gave you before our class of the two past winters, due credit for originality in respect to it), from having twice at the knee and once at the elbow, straightened out in the former case, and bent in the latter, ankylosed limbs, which in the ordinary way of accidents had the bone above broken, by beginning to bend the callus about the third week after the injury.

During the past winter I resected the knee joint in a case of angular ankylosis of the knee, in a young fleshy woman—22 years of age.—The case was of 3 years' standing. The knee was still painful and tender to the touch, fibrous bands were stretched across the joint, from which the cartilages had been removed, and the patella, which I left in place, was soldered in between the condyles. The case that was operated on in February last, did well, and the patient is now walking about with a straight limb, but as yet, only with the aid of a crutch. In two other cases, I have had this winter, of ankylosed knee joint, in which I at first thought I might have to perforate and break the bone, or resect the knee joint, I succeeded in straightening the limb by a forced extension of the leg, taking especial care to prevent any increase of the subluxation of the tibia, already thrown considerably backward in the ham.

All these three processes, it appears to me, are well suited to particular cases of deformity of the knee joint. Resection I consider the most hazardous, and only appropriate in cases where the general health is pretty good. Still, I deem it less hazardous in cases of ankylosis than in the ordinary cases of white swelling, for which it has been so often practised, in which the work of destruction is still going on.

When the knee can be straightened by force, without luxation or too much violence, I am inclined to believe that the best course to pursue, even with division of the ham-strings. But there are many cases where this is not practicable, and in patients, too, that would not bear resection, in which your method of perforation and subsequent fracture of the femur will prove a precious resource, and hold a permanent place in our science.

Some years ago I succeeded, to a good degree, in straightening the knee of a child eight years of age, in which, I am very sure, the yielding took place between the epiphysis and diaphysis at the upper end of the tibia. No great amount of irritation followed, and the subsequent solidification, in the improved position, was rapid. Is not this a measure that we might reasonably resort to with advantage?

Very truly yours,

JOSEPH PANCOAST.

D. BRAINARD, M. D.

The fourth case was ankylosis of the patella to the femur with false ankylosis of the knee joint, of one year's standing; the result of each was inflammation. The patient was a healthy girl of 16 years. As the patella could not be moved by strong efforts at flexion of the leg, while she was chloroformed, the skin of the knee was drawn forward over the patella and the broad perforator introduced from the outside and carried between the bones, which, by gentle movements of rotation, and by using it as a lever, loosened the patella with an audible snap. Adhesive plaster was applied over the puncture, and the limb left at rest for ten days, when, by moderate efforts at flexion, the patient being insensible, the patella followed the movements of the leg. Gradual extension straightened the knee in about four weeks, with little pain. This case is noticed in the *Chicago Med. Journal* for Feb., 1860.

The fifth occurred in the fracture of Drs. English and Edgar, of Jacksonville, Ill. The case, interesting in other respects, is reported by Dr. David Prince in the May number of the *Chicago Med. Journal*, 1860. It was one of deformity, after oblique fracture of the upper portion of the middle third of the femur. Overlapping occurred from loosening of a strip of adhesive plaster, and at the end of five weeks Dr. Prince re-fractured it, replaced it in dressings, which were retained seven weeks longer, and then removed the splints, union appearing to be solid and the limb straight. From want of support and proper care on the part of the patient and his parents, the callus bent so that the fragments deviated 25 or 30 degrees from a straight line, three weeks after taking off the splints! Twelve or thirteen weeks from the time of refracture, and about six weeks from the supposed time of bending, attempts to straighten it by pressure alone, were made for two days without success.

Dr. Prince was not allowed by the family to apply this, or even to see it done. The following is Dr. Prince's description of the subsequent successful treatment:

Several weeks now elapsed without treatment, after which three perforations were made through the region of fracture,

by Brainard's drill; Dr. English, assisted by Dr. Edgar, having the treatment of the case. After waiting a week, extension was applied by means of a long splint, to the distal end of which the mechanical power of Jarvis' Adjuster had been attached. Lateral pressure was made by a sort of tourniquet with a hook passing under a splint upon the posterior of the limb, and a screw pressing upon the convexity of the bone. It will be readily seen, that such an instrument would easily break down any bone, if the screw were forcibly turned.

The splint having been properly padded, the extension secured by adhesive straps, the counter-extension by a well cushioned perineal band fastening to the proximal end of the long splint, and the wooden ball of the screw of the tourniquet properly secured by gutta percha and padding, from pressing directly upon the prominent bony angle, extension was powerfully applied at the same time with lateral pressure, until a distinct yielding of the crooked bone was perceived. The lateral pressure was then slightly relaxed to avoid injurious pressure of the soft parts against the bone, but the extension was kept up unremittingly. In about three days the curvature disappeared, but as a precaution against accidental bending, the splint, with moderate extension, was kept on two weeks, and the thigh was afterwards protected by a starch bandage. Dr. English thinks there is from one-fourth to one-half inch shortening; Dr. Edgar thinks there is no shortening at all.

Here the surgical treatment ends, with an excellent result, notwithstanding two accidents, one of shortening and one of bending.

Although the result in all these cases was favorable, yet it is not to be supposed that so considerable an operation can be performed without accident.

It will be readily discovered that this method, which is here spoken of, is, in a certain sense collateral to others, particularly sudden fracture or gradual extension by force. We do not as yet know of any instrument capable of effecting a neat and perfect division of the bone with so little injury to the soft parts as not to give rise to suppuration. The invention of such an instrument is not impossible, and when it shall have been

effected, mine may be superceded. I had contrived several kinds of saw for the purpose many years since, and others have done the same, but as yet without attaining the object in view.

The operations generally resorted to for the remedy of deformity after fracture are: 1, gradual extension; 2, refracture; 3, section or resection, cutting out a V shape piece of bone.

Writers on the formation of the callus, have demonstrated the possibility of bending it with moderate force for a certain time after it appears firm. This not only proves the possibility of remedying certain deformities by pressure, but also shows the great danger of bending, occurring from too early removal of splints. This is an accident which seemed to have happened not unfrequently, and has been the source of infinite annoyance to surgeons as well as to patients. Prof. James P. White, of Buffalo, and Dr. David Prince of Jacksonville, Ill., have had each a suit brought against them for malpractice on account of this accident, for which they were in no wise responsible. I have repeatedly straightened members which had become slightly bent by the pressure of splints when the consolidation was about taking place. I met with an instance where the femur bent considerably from being laid on a pillow, after the union seemed so firm that the surgeon had taken off the dressings.

The question naturally arises, how long after a fracture does the callus remain in this flexible state? Facts are wanting to determine this point with certainty. Dupuytren is said to have accomplished it as late as the fourth month, and fixes upon the end of the eighth week as the medium time. M. Desgranges straightened a leg at the end of four months "by means of a machine, making well applied pressure on the protuberant angle of the fracture," (Norris in *American Journal of the Med. Sciences* for Oct. 1842, p. 305.)

It is evident that the period at which this operation may be successfully attempted, must vary very much in different cases. John Hunter says that a well adjusted fracture will unite in three weeks. I am not certain of having ever seen union take

place in so short a time, except in fractures of the clavicle in infants, and after fracture of one of the metacarpal bones. I should be disposed to place the average time at four weeks for the radius or ulna, six weeks for the tibia or humerus, and eight weeks for the shaft of the femur. And I think the callus might be bent by pressure, from two to four weeks after apparent union has taken place. There may, however, be exceptions both ways, and in case much force should be required, I should advise the use of perforation as a means of first weakening and then softening the callus, before resorting to a great degree of pressure.

Extension has generally been conjoined with pressure in these cases, and in many should not be neglected.

Rupture of the Callus.—This is a proceeding which has had advocates and opponents from the earlier times. Most modern surgeons have admitted it in extreme cases, but only when the member is not very useful without it. Haly Abbas, Malgaigne, Davernay and others, have cited cases of death from refracture after firm union. Turner has known abscess and want of union to follow. I have ruptured the callus with the hands in a fractured forearm of a girl about five years old at the end of six weeks. The bones overlapped with a very serious deformity, and the surgeon came to me in great anxiety, the deformity having been only perceived when the splints were removed. I put the patient under chloroform and pressed the member upon a padded cushion with my hands. It broke suddenly, with a snap, without great force, and the bones reunited without much deformity.

Those who have written expressly on this subject, have recommended machinery of various kinds for the purpose of effecting the object. It is likely that, rather than resort to great force, perforation ought to be preferred. Indeed, I should hesitate to refracture a member after more than four months had elapsed.

Resection.—In cases of long standing and great deformity, resection has been from a very early period resorted to. It is

reported to have been done upon the celebrated founder of the Jesuits, Loyola, as early as 1821, for a badly set fracture of the thigh, (Norris, loc cit). Gardiel relates a case where it was performed on the bones of the forearm with success. Wasserfuhr of Stettin, resected a piece of the femur in a child five years old, in 1816. Riecke operated on the same bone in 1827, with success. Clermont, a French Naval Surgeon, operated on two cases after fracture of the femur, with success. M. Dunn, of Scarborough, resected a projecting angle on the tibia.

Messrs. Duncan, Warren, Parry, of Indiana, Key, Portal, Stevens, Mathew and Barton, have also used resection.

The Seton.—Winchold, in a case of deformity after fracture, drilled a hole through the callus and inserted a Seton. About the seventh week the callus began to yield, and the limb was made good by extension. (Malgaigne's Operative Surgery, p. 188.)

I have shown that the Seton produces absorption of bones. The practice of Winchold is therefore well founded, but it is more dangerous than subcutaneous perforation, and less certain than section or resection. It is doubtful therefore if it will be found of frequent applicability.

When all means fail, and the member is an obstacle to labor, amputation may be desired, and the surgeon is justified in performing it under such circumstances.

III. *Reduction of Dislocations of the Hip by the hands, without Pulleys or other Mechanical Power.*

The method which I have found successful in dislocations of the hip into the thyroid foramen, consists in placing between the thighs and against the perineum a piece of wood properly padded, which serves as a fulcrum, and making use of the members with the knee extended as levers, by which I have uniformly been able to reduce this dislocation. The first case

treated in this way, occurred to me at Michigan City, Ind., and both the pulleys and Jarvis' Adjuster had previously been tried without success. I tried the pullies and all the force deemed proper, but did not effect the reduction. I then wound a piece of wood with quilted stuff so as to make it about six inches in diameter, and placing it as directed, found little difficulty in effecting the reduction. I have since succeeded in three other cases, one of which was in January of the present year. In this case the same plan was resorted to, except that the piece of wood was smaller, not more than $4\frac{1}{2}$ inches in diameter when covered, as this size allows of the members being brought nearer together, or even crossed, before much force is exerted, so that the head of the bone is not pressed so much upward against the bones of the pelvis as when the members are widely separated. This may be a point of some importance, for it is evident that the neck of the femur might be fractured if the head should be so fixed as to prevent its rising out of its position.

The great severity of these accidents renders any additional facilities for remedying them of value, and this plan is submitted in the belief that it is new and of easy execution.

IV. *Immobility of the Lower Jaw.*

The movements of the lower jaw are liable to be impeded or destroyed by many different causes, among which the formation of cicatrix from extensive ulceration or sloughing, is the most frequent. I have met with a large number of these cases in every degree, from that where thin bands extend from one to the other jaw, to that where large openings have remained through the cheeks or lips from perforations by gangrene. Dr. Mott, in 1829, published a case of this kind relieved by incision of the cicatrix, and separating the jaw by an instrument devised for the purpose. In 1843 I published two cases treated in the same manner, by a machine constructed with two curved pieces of steel adapted to the frame of a common tourniquet.

This operation is an old one, and in the tenth edition of the works of Ambrose Pare, printed in 1861, book xii. p. 309, may be found the figure of an instrument superior to that of Dr. Mott, and to my own, with the report of a case in which he made use of it.

Heister, in fact, gives the figure of an instrument of which that of Dr. Mott, is an exact copy, and another differing but little from that of Pare, with the following advice about their use:—"But, in truth, far from thinking that they may be useful in certain cases, I, on the contrary, regard them as very pernicious." *Institutions de Chirurgie, Tome. 3, p. 78, pl. 20.* Mutter made use of this instrument, first dividing the masseter muscle and opening the mouth gradually by turning the screw "a thread or two daily."

My object in noticing the subject here, is to say that this operation has proved in my hands much less successful than in the cases which I published in 1843, and that in those there was a degree of contraction which diminished the movements of the jaw, even after the lapse of a year. So unsatisfactory is the result, that in many cases where the bands are extensive and the cheeks not perforated, I have advised against any surgical interference.

Recently, however, having met with a case of the kind, in which the deformity was confined to one side, I adopted a plan, new, as far as I know, which gave a result perfectly satisfactory. The patient was a man some 40 years of age, who, 11 years previously, had a sloughing of the right cheek from the use of mercury, which left an opening extending from the mouth to near the coronoid process of the jaw. There were no teeth in the lower jaw on the right side, and behind the opening was a firm band binding the jaws so firmly together that movement was hardly perceptible. Instead of dividing or breaking the cicatrix in this case, I resected all that portion of the jaw situated below the opening, and after vivifying the edges, brought the tissues above and below the fissure together, and secured them by stitches of twisted suture. The wound healed readily;

the lower jaw of the left side, where there were teeth, was perfectly moveable, and the deformity remaining was such as not to be very noticeable. When a piece of jaw is removed in this manner, the opposite side is liable, unless care be taken, to prevent it to move laterally for want of support. This should, when necessary, be guarded against by having a little clasp, made by a dentist, to fit the teeth above and below, somewhat in the shape of an H. Dr. Mott says, that he has not found these deformities in any case to result from the use of mercury. I have never met with a case in which mercury had not been previously used.

V. *Operation for the Removal of parts of the Lower Jaw.*

I have removed the lower jaw from the articulation to near the symphysis of the chin three times. Once in 1853, for enchondroma; once in 1858, for soft cancer; once in 1858, for a hard fibrous tumor, of the nature of which I was doubtful. In each of these the parotid sub-maxillary and a number of the lymphatic glands were involved in the disease and were removed. The first patient died about one year after, apparently from return of the disease within the cranium. The other two are, I believe, still living in good health.

I have several times removed the chin as far back as near the angles of the jaw, for disease originating in the bone or in the lip or glands. In all these operations upon the lower jaw, I use the curved incision so as not to involve the lips.

VI. *Removal of the Upper Jaw including the Malar, part of the palate bone, and in one instance, the Vomer.*

One of these operations was performed as early as 1846, for a fibro-cartilaginous growth. One was performed in 1851, for a tumor, probably cancerous, and the third in March, 1860, for a soft cancer, which had already required two operations.

VII. *Extirpation of the Parotid Gland.*

I have twice removed the parotid gland, for disease originating apparently in the gland itself. The first operation was performed in Jan., 1857. The disease appeared to be scirrhus. The external carotid artery and the facial nerve were divided, but by going below the gland and tearing the tissues, instead of using the knife, the operation was not attended with great hemorrhage.

The second operation was performed in Nov., 1858, for a tumor believed to be what M. Paget calls "Mydoid." An attempt had already been made to remove this tumor, but after making an incision, the surgeon desisted. This operation was more difficult than the former, principally from adhesions and the cicatrix resulting from a previous attempt. As doubts have been actually expressed concerning the practicability of this operation, I add a list of names of those who have reported instances of it without pretending to pronounce in how far the accuracy of some of them might be called in question. I do not think that there is in this list a single case reported by surgeons in America, concerning which any reasonable doubt of accuracy ought to be entertained. Every experienced surgeon of the present day, knows well the difference between those cases of diseases of the lymphatic glands, in which they encroach upon the parotid, and diseases of the parotid itself. Dr. McClellan, who removed the parotid gland eleven times, states that he has removed other tumors from the region thirty times, and I have myself removed diseased jaws and other tumors which encroached upon the space usually occupied by the parotid gland ten times. If, however, it should happen that the cancerous element deposited just beneath or around the salivary gland, or in a lymphatic ganglion, should so increase as to cause absorption of the glandular tissue, I see no reason why the operation of its removal would be different from that of removal of the gland itself. Yet this is one of the objections urged against the operation, which in this respect, is a difference in words only, and not of facts,

List of Operations for Removal of the Parotid Gland.

			Bro't forward, 56.		
Chelins,	8.		J. D. Larrey,	1.	
Preiger,	1.	1826.	J. C. Bradbury,	1.	
Barendts,	1.		Van Sweiten,	1.	
Schmidt,	1.		Roonhuysen,	1.	
Weinhold,	1.		Gottfried,	1.	
Beclard,	1.	1823.	Errhart,	1.	
Goodlad,	1.		Scharschmidt,	1.	
Charmichael,	1.	1818.	Soucramp,	1.	
Lisfranc,	1.	1826.	J. B. Seibold,	1.	
Manfredini,	1.		Moulinie,	2.	
Idrae,	1.		L. Herminier,	1.	
Kirby,	1.		Heyfelder,	1.	
Busche,	1.	1827.	Bernet,	1.	
Samuel White,	1.	1808.	M. N. Fouthern,	1.	
Geo. M'Clellan,	11.		A. Magri,	1.	
Klein,	1.		Hendricks,	4.	
J. H. B. M'Clellan,	1.		Eulenberg,	1.	
Gensoul,	2.	1828.	Stedman,	1.	
Seibold,	1.	1781.	Awll,	1.	
Scultetus,	1.		Eckstrum,	1.	
Gooch,	1.		Anisaux,	1.	
Behr,	1.		McGregor,	1.	
Palfin,	1.		Widmer,	1.	
Verduin,	1.		Ohle,	1.	
Acrel,	1.		Dieffenbach,	1.	
Astley Cooper,	2.		Wallman,	1.	1828.
David Prince,	1.		Bendz,	1.	1838.
J. C. Bradbury,	1.		Naegle,	1.	1830.
J. C. Warren,	1.		J. Bell,	1.	
Mott, (Several)	3.		Brainard,	2.	
N. R. Smith,	1.				
Randolph,	1.				
Roux,	1.				
Cordes,	1.				
Warren, (Elder)	1.				
Carried forward, 56.					
				91.	

NOTE.—I have omitted to insert about twenty-five operations in which the entire removal of the glands has been called in question, although they have been reported on very good authority. I have inserted a number such as that of Heister, which have been questioned without reason as far as I can see.

VIII. Improvements in the Operation of Opening the Trachea.

In March, 1859, I published the report of a case of operation for foreign body in the air passages, to which were added some suggestions for rendering it more easy and safe. They are deemed of sufficient importance to be reproduced here.

The suggestions which I have to offer in regard to tracheotomy, relate to the means of preventing hemorrhage, to keeping the opening made by the operation pervious without resorting to a tube, and at the same time, controlling the entrance of cold air abruptly into the lungs.

1. *Hemorrhage*.—No experienced surgeon will deny that this is a serious difficulty in this operation. M. Guersent, surgeon of the children's hospital at Paris, than whom there is no better authority on this subject, relates several cases where death occurred from opening large vessels, and one where it happened from the division of the thyroid veins.* Syncope is a frequent effect of this loss of blood, and even suffocation may occur. M. Guersent advises sucking the blood out of the trachea with a catheter, when this is threatened.

In order to prevent hemorrhage, I proceed in the following manner: Having incised the skin and facia by successive and careful incisions, I press the sterno hyoid and sterno thyroid muscles to each side with the fingers, and thus expose the thyroid body. This effected, I pass under the isthmus a director curved, or an aneurismal needle. This is followed by a common suture needle, which may be passed with the blunt end foremost, armed with two very strong ligatures. A ligature is then tied very firmly on each side, and the isthmus of the thyroid body divided between them. A little dissection with a blunt instrument denudes the trachea to the required extent, and an opening can be made without danger of a drop of blood being drawn into it.

The ligatures which have been thus secured, serve the purpose of fixing the trachea, if desirable, and they may be tied behind the neck so as to raise it forward, and keep the wound open. I never open the trachea until the hemorrhage is stopped, and a large surface of it has been quite denuded.

2. *Keeping the opening in the trachea pervious without resorting to a tube*.—The objections to a tube are twofold: 1st,

* *Gazette des Hospitaux* for 1854, p. 59.

when the operation is performed for the extraction of a foreign body, it prevents its exit ; and it is desirable to leave this opening in such a state that the foreign substance may escape whenever it becomes loosened from its situation in the bronchia. 2nd, in tracheotomy for croup, the prolonged sojourn of the tube has been considered, by the most eminent surgeons, as a cause of the pneumonias which so frequently are the cause of death.

The necessity for using the tube I avoid by the following means : Having denuded the trachea, insert a small suture needle, armed with a ligature, beneath two of its rings. Withdraw the needle, and, drawing gently upon the thread, make a semi-circular incision on one side, so as to form a valve, readily opened by drawing upon the thread. The opening thus formed can be kept patent or be allowed to close at will.

This is a matter, perhaps, of much greater consequence than might be supposed without reflection. Most surgeons have found their operations for tracheotomy less successful than they had reason *a priori* to expect, and this has been attributed to the direct entrance of cold air into the lungs. Trousseau and Guersent have both advised that the air inhaled at that time should be quite warm without being too hot.

I have ascertained, by direct experiment, that tracheotomy on dogs is followed by a diminution of temperature. I made a small opening in the skin of a strong dog, upon the side of the thorax, and introducing a thermometer, I found the temperature 98° Fahrenheit. I then performed tracheotomy, and at the end of forty-five minutes the temperature had fallen three degrees. This experiment was repeated twice. In one case the result was the same ; in the other, when the temperature before the operation was only 95°, it remained the same after.

Every experienced physiologist knows the facility with which young animals die from reduction of temperature, and when we consider the tender age and depressed state of most of the subjects of tracheotomy, it is reasonable to believe that a reduction such as we have noticed is capable of producing, directly

or indirectly, the most injurious consequences. Impressed with this belief, I some years since contrived a cover for the opening into the trachea, composed of wire gauze and sponge, to retain the warmth and moisture of the expired air, and communicate them to that which is inspired. The difficulty of procuring and using this cover, prevented me from publishing an account of it. It afterward appeared to me that the same object might be in a great degree attained by making a valvular opening, so that the air could be directed through the larynx whenever its issue below might not be necessary.

In croup this may be impossible to any great degree, but in the case of foreign bodies, my experience leads me to expect that it will be found both useful and of easy execution.

IX. *On the best means of controlling Hemorrhage in certain Operations.*

In operations on the lips and jaws, I am in the habit of using a forceps with a slide, which I put upon the lips, or in operations upon the jaws, upon the cheeks from the angle of the mouth to the coronoid process of the lower jaw, and fixed so as to compress the vessels, renders the operation much easier, and saves considerable blood. I have used it in several operations for hare lip, excision of the lower lip for cancer, and in one operation, for the removal of the lower jaw, and have been pleased with its effect. In cases of hemorrhage from the throat from removal of the tonsils, or other wounds, I use compression with the fingers without and within, and have thus been able in several instances to control bleeding which was troublesome.

In amputations of the thigh, too high up for the application of the tourniquet, I should at present recommend the use of a compressor to act upon the abdominal aorta. One constructed similarly to those employed on the femoral artery for aneurism, but sufficiently large to embrace the abdomen, could be readily applied and borne when the patient is under the use of chloroform. I have not yet resorted to this means, but shall do so on the first favorable opportunity.

As a hemostatic, I prefer the per sulphate of iron. It is a powerful astringent, but does not cauterize. Pressed upon the mouth of a bleeding vessel, and allowed to remain, it forms with the blood a dark, tenacious coagulum, which, to effect the object, must be allowed to remain.

X. *Cure of Naevus by Collodion.*

In Sept., 1844, I published in the North Western Medical Journal some cases of Naevus, treated by the application of the ethereal solution of gun cotton, (p. 224). As this treatment is now going the round of the medical periodicals as originating abroad, I refer to this article for the purpose of reclaiming priority, and in order to state that it is only useful in superficial naevi of limited extent, and situated on a bony surface. These tumors not unfrequently disappear soon after birth without any treatment, which is liable to give rise to misapprehension as to the value of remedies.

When erectile tumors are of a certain size, excision with the knife is generally the best remedy. When this is impracticable, the ligature, used in various ways, may be resorted to, and there are some cases in which caustic, seton, injection, and ligature of the arteries, or a combination of these means, may be required.

XI. *Injections of Solutions of Lactate of Iron in Aneurism Anastomosis.*

In 1853, I reported, in the London Lancet, a case of Aneurism by Anastomosis, of the orbit, cured by injecting into the center of the tumor through the canula of a fine trochar, one fluid drachm of a saturated solution of *Lactas Ferri*. The patient, Wm. Wells, of Yankee Settlement, Ill., is a well known citizen, and remains at this time, April, 1860, cured. The disease has not in the least returned. Not proposing at the present time, to enter into the subject of injections into sanguine tumors, of various kinds, and aneurisms (which has principally

been done with the prechloride of iron), I only refer to the subject for the purpose of giving the ultimate result in this case. There seems to be no good reason why it should not be resorted to in any similar case. In venous erectile tumors, I have found it of very little effect. In aneurisms proper, it is probable it would be useless or dangerous.

XII. *Compression for the Cure of Aneurism.*

I have now resorted to the pressure of the femoral, for the cure of aneurism of the popliteal artery, four times. In one only, did it prove successful. This was a case treated about one year ago. The others were unfavorably situated in regard to the attendance, and two of the patients were incapable of understanding the importance of the treatment, and refused to endure the pain and inconvenience inseparable from a sufficient continuance of pressure.

There is no doubt, that compression by the fingers of intelligent assistants, is best, where the services of such can be commanded. Otherwise, a very perfect instrument has to be resorted to.

XIII. *Resection of the Knee Joint.*

I have at the present time performed resection of the knee joint for disease three times. Of these cases two recovered, and have now useful members. One died after amputation of the thigh. It is proper to say concerning this latter, that amputation was advised on the first instance and rejected by the patient, and that when he finally decided to submit, and even urgently demanded it, his condition was such as to afford little prospect of recovery. Prof. Freer has performed resection in one instance on the adult with entire success, so that the result of the operations in Chicago, as far as known, is—

Cure with anchylosis a good limb,	3
Death,	1—4

XIV. *Treatment of Indolent Ulcers by Vapor of Iodine.*

During the last three years nearly all the cases of indolent ulcers entered under my care to the U. S. Marine Hospital,

have been treated by the vapor of iodine. The result is very satisfactory in nearly all cases ; more so, by far, than that obtained by any other single method. Its advantages are conceived to be these :

1. Cleanliness and facility of application.
2. Rapidity of cicatrization.
3. Destruction of the odor of the ulcer. Iodine acts as a disinfectant, like chlorine.

The manner of using it is as follows :

1. Dress the ulcer with simple cerate, spread on lint.
2. Take from one to four grains of iodine, according to the size and degree of indolence of the ulcer, folded in several layers of lint, and place it on the ulcer, over the first layer.
3. Cover this with a piece of oiled silk and tin foil, which should be large enough to extend beyond the edges of the ulcer. This is to prevent rapid vaporization, and it should be secured by a roller.

The warmth of the member speedily vaporizes the iodine, and a sensation of warmth is perceived by the patient on the ulcerated surface. If applied in too large quantity, or too directly on the surface, the iodine acts as an escharotic. Care is therefore required in this respect.

Tests of the urine of patients submitted to this treatment, uniformly revealed the presence of the iodine in this secretion very soon after its application to the ulcer. Dr. Woodward, of Galesburg, has reported some of the results of these tests in a recent No. of the Chicago Medical Journal.

XV. *On the Absorbiny Power of Ulcerated Surfaces.*

Systematic writers have sometimes defined an ulcer, "a solution of continuity of the soft parts secreting pus." This definition makes no distinction between ulcers and cicatrizing wounds.

I have been in the practice for many years of defining in my lectures an ulcer as an abnormal respiratory surface in which

various chemical actions take place, according to the characters of the surface. From some experiments made in 1855, and published at that time in the North Western Medical Journal, the following conclusions were deduced in regard to the nature of some of these chemical actions :

1. Recent ulcers absorb pure oxygen, or the oxygen of the atmosphere without giving out carbonic acid.

2. The same ulcers absorb carbonic acid rapidly—this or its combination with soda on the surface may account for this gas not being found in the cup when oxygen has been absorbed.

3. On ulcers absolutely excluded from air, no pus or imperfectly elaborated pus was found.

4. Chloride of sodium is found on the surface of ulcers, to which carbonic acid gas is applied, and from which atmospheric air is excluded.

5. Chronic ulcers do not absorb gases

6. Fresh wounds absorb oxygen and eliminate carbonic acid, which is not absorbed.

XVI. *On the Operations Performed for Accidental Adhesion, and for Congenital absence of the Vagina.*

Imperforate hymen and adhesions of the walls of the vagina of limited extent, are accidents so easily remedied by simple refraction or incision, as not to require comment. Dr. A. E. Ames, of Minneapolis, formerly of Roscoe, Ill., and the late Prof. Hard, of Aurora, have each reported a case of this kind treated with success.

In cases of more extensive adhesions from injury or inflammation, the practice of making incisions for the purpose of allowing the escape of the menstrual blood when it accumulates, is also well established, although this operation has sometimes proved fatal. I have performed two operations of this kind for perfect obliteration, which were entirely successful, and the only suggestion which I think useful, in addition to what is already known on the subject, is making the opening wide and keeping a considerable sized pessary in it until cicatriza-

tion is completed, instead of resorting only to a small puncture, and keeping in a bougie as has sometimes been recommended. The plan I propose is followed by a very perfect restoration of the function of the canal.

Congenital absence of the vagina and uterus, or with the uterus in a rudimentary state is a malformation about which I have been consulted in three cases. In all, the external organs and breasts were perfectly developed, and the sexual feelings of usual strength

All were married women. In two of these I formed an artificial passage, by careful incision, and separations of the tissues with the finger, which, with a metallic or gum elastic pessary was entirely cicatrized of the natural size and length of the vagina. In the other, from the ignorance of the patient, or from the interference of the husband who had commenced a suit for divorce, and was unwilling the operation should succeed, the pessary was removed after a few weeks, and the result was null. I am, however, of the opinion, that while such malformations ought to constitute an obstacle to marriage, yet when this state has been entered into ignorantly, and when an operation is requested, its performance may be justifiable and the result be such as to permit of the performance of the sexual contact. For the further elucidation of this subject, I refer to my essay published in the Chicago Medical Journal, for July 1859.

XVII. *Treatment of Chronic Hydrocephalus, by Injections of Iodine.*

In the No. of the North Western Medical Journal for 1850, I published the report of a case of chronic hydrocephalus treated by injections of a solution iodine and iodide of potassium. In the No. of the same Journal for April 1860, this case was re-published with another resulting favorably, and such reasons adduced as were deemed sufficient to justify the resort to this method of treatment in any favorable case. As these cases are given in full by Boinet, in his work on the "therapeutical

uses of iodine," as well as in many medical periodicals; and in order not to render this report to voluminous, details will be omitted here.

The treatment of my case was commenced Oct. 13, 1849, by the injection of $\frac{1}{8}$ gr. iodine, and $\frac{3}{4}$ iodide potassium in half a drachm of distilled water. The operation was performed in all, nineteen times during seven months, and for a time seemed to promise success, but at the end of about six months the disease resumed its usual course and proved fatal.

The second case is that of Dr. Tournesko, of the Civil Hospital of Koltza, in Bucharest, which occurred in 1856, who used about sixteen grains iodine and three drachms of alcohol, of which one eighth part was allowed to flow out.

Thirty-five days after the operation, the head was of the natural size, and the child was considered cured.

The following are the details of this operation as given by Dr. K. :

1. A large sized trochar was used.
2. It was carried to the depth of about two inches.
3. The point chosen for puncture was in the coronal suture at an angle of 45° with the horizon, (*Gazette Des Hopitaux*, for 1856, p. 489.)

The plan which I should at present recommend is :

1. Use a common sized trochar.
2. Draw off as much fluid as practicable after tapping, compressing the head with a band.
3. Inject a solution of iodine and iodide of potassium of the strength of 5 grs. of the former and 15 of the later to the fluid oz. of distilled water through a gum elastic tube passed through the canula down to the bottom of the cavity, and after allowing it to remain about thirty seconds, withdraw it by suction without moving the syringe, but a small quantity, say 1 oz. should be thrown in at first, but if it is withdrawn successfully, more may then be used in the same manner.

XVIII. *Treatment of Spina Bifida, by Injection of Iodine.*

This operation was first proposed and performed in Chicago, May 3d, 1848. The patient was a girl 14 years of age. Thir-

teen operations were performed during five months, when the cure was perfect. The puncture has been resorted to in ten cases since, besides one by Dr. Charles Brackett of Rochester, Indiana, which was not completed, but was progressing favorably at last advices after several operations.

Of these eleven operations none have produced dangerous results immediately, nor has death resulted in any case as far as results have been made known from the operation. In several, death occurred from the natural progress of hydrocephalus with which the spina bifida was associated.

Notwithstanding these facts, which no one has attempted to call in question, we still see the operation of puncture, ligature and even excision resorted to from long established habit by those who would regard injection as unjustifiable. It is for this reason that I have taken pains on every suitable occasion, and particularly in an article in the Chicago Medical Journal for Sept. 1859, not only to call attention to this operation, but to point out the reasons which in cases proper for any operation render it both safe and efficient.

I have often pointed out that the *desideratum* in these cases, is a method of treatment which is subcutaneous, and which does not expose to the danger of ulceration or suppuration of the sac, erysipelas, or the sudden removal of the pressure by evacuating the fluid. These are the accidents by which spina bifida proves fatal, and which are effectually guarded against by this operation. It produces, in the lining membrane of the sac, a moderate adhesive inflammation, which gradually thickens the coverings, while it changes the structure of the exhaling membrane of the tumor.

For the details of this subject, I refer to the article in the Chicago Medical Journal, already alluded to. The following are the rules for injecting the tumors which I have thus far adhered to:

1. Make the puncture in the sound skin, at the side of the tumor.

This avoids the danger of erysipelas or ulceration, which might result from puncture of an unhealthy tissue, and permits the suppression of leakage of the fluid, which is a source of danger. It is best to use a small sized trochar.

2. Evacuate no more of the serum than the quantity of solution about to be injected.

This obviates the danger resulting from sudden and too great removal of the pressure on the spinal cord.

3. I inject a solution of iodine and iodide of potassium, with $\frac{1}{4}$ gr. of the former to $\frac{3}{4}$ of the latter, and retain it by slight pressure.

4. If symptoms of irritation supervene, the contents may be withdrawn, and the sac filled with distilled water. (I have had occasion to do this but in one instance).

5. Lay the patient after the operation on the side or on the face, and if there be much heat, use warm evaporating lotions to the tumor and to the head.

6. When the tumor becomes flaccid, apply collodion* or pressure to the surface. This should not be omitted for some weeks after the cure seems perfect.

7. After the effect of one injection is past, repeat it as many times as may be found necessary, increasing or diminishing the strength of the solution according to the effect produced.

In the cases operated on by Chassaignac, Nelaton, and Velpeau, these precautions were not taken. The iodine was employed, and the sac emptied; but in young children, and where the sac is not pediculated, it may be safer to adhere to these rules.

Since presenting this Report, I have treated successfully another case of Spina Bifida, the report of which is here inserted, as it possesses many points of interest.

June 6, 1860, a female child from Michigan was presented to me for treatment. It was eight months old, well formed,

* NOTE.—The application of collodion as a sole means of curing Spina Bifida, is now being published by the medical periodicals of this country, as a new treatment, originating in Europe; I have employed and recommended it for many years, but alone it is generally without effect.

and healthy in every respect, excepting a tumor situated over the upper part of the sacrum. This tumor measured six inches in circumference around the base; eight inches around its largest part, and was elevated two inches above the surrounding skin. Its surface was irregular, resembling that of a tomato, or a piece of the colon when inflated. It was translucent, elastic at points, and at others the walls were firm like the tissue of a cicatrix. A great portion of its contents could be pressed into the spinal column without giving rise to any other inconvenience than making the child cry.

June 6.—Present, Dr. Haydock. I passed an exploring trochar into the sac, through a part of the covering, which was thick, and drew off about one ounce of fluid. I then had the neck of the sac pressed on each side, and injected through the canula a solution containing $\frac{5}{8}$ gr. of iodine, and $1\frac{1}{2}$ grs. iodide potass, in a drachm dist. water, intending to let it flow back through the canula. This, however, would not do, and I injected two drachms of distilled water, which was allowed to remain. The child, during the operation, was kept under the influence of chloroform. The operation was done at 6 o'clock, P. M.

8 o'clock.—Skin hot; child starts in sleep as if frightened; takes the breast.

June 7, 8 o'clock, A. M.—Has not slept well; has perspired freely; taken the breast; tumor flaccid.

6, P. M.—Seems perfectly well; tumor tense and redder than before the operation.

June 8, 12 M.—Child seems perfectly well; urinates more than natural; tumor tense and red; child laid on the face and side.

June 9.—Tumor red and firm; child perfectly well.

June 10.—Tumor flaccid and pale; applied bands of gum elastic around it.

June 14.—Tumor much reduced. Introduced into a point where the skin is thick and sound, a common hydrocele trochar, and drew off about two drachms of serum tinged with blood from wounding the internal membrane; washed out the

cavity with dist. water, and injected the solution used before, as much as could be pressed in, then washed it out with dist. water and applied isinglass plaster.

During the operation a tape was tied tightly around the base of the tumor, so as to cut off the connection with the spinal canal, and the child kept under the influence of chloroform.

The operation seemed at first to produce no sensible effect. About an hour afterwards, the child had coldness of the feet and hands. This was followed by some reaction, and this by sweating. The next day there was some redness and fullness of the tumor, which had already lost its elasticity.

The patient was seen by Drs. Powell and Paoli.

For three days the tumor was tense, firm, and red. After that time, it became pale and flaccid.

June 25.—Applied pressure by a gum elastic band around the body, and a band of the same material around the tumor. While this remained, it was reduced to about one-third its former size.

June 30.—The tumor is pale, wrinkled, firm, not fluctuating; appears quite solid. Pressure continued by a strip of adhesive plaster passed circularly around it, and the gum elastic band made for the hernia truss passed around the pelvis, so as to exercise compression upon it.

July 6.—Tumor forms only a nodular mass, diminishing in size. The patient was allowed to return home with directions to continue the compression as long as might be necessary to efface the walls of the sac.

Remarks.—In the Chicago Med. Journal for September, 1859, I gave a full account of the origin and history of this treatment as applied to spina bifida, up to that date.

The cases then treated numbered but ten. Since that time Dr. Brackett, of Rochester, has had a case under treatment, the result of which has not yet been fully ascertained, but which, Dr. Brackett writes me, promises to be favorable, as,

although very delicate, the child had, thus far, (at the time of writing), been better from the effect of each injection.

The case above reported is the sixth which I have treated by injections, and is the most favorable, being the first which was uncomplicated by hydrocephalus or paralysis. It was also more favorable than previous cases in these respects; the tumor was pediculated so that the injection could be readily prevented from entering the spinal canal, and the walls of the tumor were so thick, at points, that a common hydrocele trochar could be used without danger of subsequent leakage or ulceration.

In any similar case, I should advise: 1st, to tap the sac and draw off the serum; 2nd, to make compression so as to prevent the iodine from entering the spinal canal; 3rd, inject a solution of iodine, of the strength of five grains, and thrice that quantity of iodide of potash to the fluid ounce of distilled water; 4th, withdraw the injection, wash out the sac with distilled water; 5th, re-inject the serum, or fill the sac with distilled water. The puncture should be carefully closed after withdrawing the canula.

When the tumor is not pediculated, so that the solution may be prevented from entering the spine, then the rules I gave in the article referred to, seem to me judicious.

In the case herein reported, no symptoms were produced except those of an over-dose of the solution, diaphoresis, and diuresis, and, except for the difficulty of getting rid of the firm walls of the tumor after the sac was obliterated, the case was not more difficult to treat than a hydrocele.

XIX. *Iodine as an Antidote to Serpent Bite and Poisoning by Woorari.*

In the year 1853 and previously, I was engaged in some experiments on the effects of various substances on poisoned wounds. Having at my disposal at that time several venomous serpents of the class of the *crotali*, I made them bite pigeons and chickens, and applied to the wound such substances as are

reputed antidotal. I also made the same experiments on dogs, in which animals I was enabled to notice the effects on the blood more easily than could be done in birds.

The effects observed after such bites were as follows :

LOCAL.

1. Swelling, which takes place rapidly.
2. Severe pain, which is felt instantly.
3. Discoloration of the part, which is entirely that of gangrene in other wounds.

GENERAL.

1. Tremulous movements.
2. Spasm of all the muscles and of the larynx.
3. Paralysis, occurring in birds first in the legs.

Anatomical changes noticed after death.—The tissues about the wound were slippery and gangrenous. The wound had an odor of putrefaction. The blood, when death takes place only after a certain time, is found filling the cavities of the heart, and not coagulated.

Under the microscope, the globules of the blood of birds were seen altered in shape and broken down. This appearance is constant when the blood is viewed between plates of glass. When mixed with glycerine, it is less perceptible. No substance used had any effect in delaying the death of the animals employed, excepting strong caustics and solutions of iodine. The following are the conclusions in regard to treatment, which I published at the time :

The solution of iodine and iodide of potassium, in the proportion of ten grains of the former and thirty of the latter to the ounce of distilled water, is, within certain limits, an antidote to the venom of the rattlesnake.

When the venom is deeply inserted, or when it has been absorbed, the antidote, to be effectual, must be infiltrated into the tissues.

This infiltration can be performed without causing loss of substance, or producing either eschar or suppuration.

Fuller details of these experiments will be found in the annual Address before this Society for 1854.

This subject is referred to at the present time for the purpose, in part, of reclaiming priority in the use of iodine, for a member of this Society, to whom it is justly due.

In the No. of the American Journal of Med. Sciences for Jan., 1858, appears a communication from Dr. Hammond, on the subject of a peculiar combination of substances as antidote to the bite of the rattlesnake. This combination, according to Dr. Hammond, is composed as follows:

" R.	Potassa iodide,	gr. jv.
	Hydrarg. chloride corros,	gr. ji.
	Bromine,	3 v.

Mix. Ten drops of this mixture, diluted with a table-spoonful or two of wine or brandy, constitutes a dose."

Dr. Hammond gives the following account of the origin of this "antidote":

"Some four years since, Prince Paul, of Wurtemberg, the celebrated naturalist, communicated to my friend, Mr. De Vasey, the results of some experiments performed before the French Academy of Sciences, by Professor Bibron, relative to an antidote to the poison of the rattlesnake. According to Prince Paul, Professor Bibron allowed a rattlesnake to bite him in the lips, cheeks, etc."

Not having access to the *Comptes Rendus* of the Academy of Sciences, I am not able to speak of the experiments of Prof. Bibron. The report that he had allowed a serpent to bite him etc., is calculated to throw doubt upon the value of the "antidote," as such practices are more in accordance with the habits of showmen than those of men of science, and assuredly would not have been countenanced by a committee of the French Academy. Dr. Harlan reported some experiments, performed many years since in Philadelphia, in which an exhibitor of serpents allowed them to bite him, but the antidote he used was a vegetable substance, now known to be worthless.

I have not been able to find any allusion to such experiments in the Medical periodicals of Paris, which always contain everything interesting, relating to such subjects, which comes before the Academy of Sciences.

Whatever these experiments might have been, the merit of proposing iodine and bromine as an antidote to the venom of

serpents, does not in any way attach to Prof. Bibron. On this point, the following extracts from a report by M. Flourens, perpetual Secretary of that Academy, presented at its sitting of April 9, 1853, is sufficient authority :

"In the session of the Academy of Nov. 24, 1853, M. Brainard, Professor of Surgery in the Medical College at Chicago, (Illinois,) presented to the Academy a *memoire* touching the action of solutions of iodine as antidote to the bite of several crotali, particularly the *crotalophorus tergeminas*. The experiments of M. Brainard were made on pigeons, which, bitten by this serpent, die very quickly. To prevent the effect of the venom, M. Brainard first applies cups which retained absorption, then infiltrates the wound and surrounding parts with a solution, composed as follows :

R.	Iodine,	gr. v.
	Iodide Potash,	gr. xv.
	Aq. Dist,	℥ i.

"By means of this substance, employed in time, and with the precautions we have indicated, M. Brainard saved the life of the animals in most cases. We only report here the results obtained by M. Brainard, as he announced them. For want of serpents which he used in America, but which were wanting in Paris, his experiments could not be repeated before this commission"

"It was then that this skillful and laborious observer turned his attention in another direction. Having, thanks to Prince Charles Bonaparte, obtained a certain quantity of the American poison called *curare* (woorari), he tried against this terrible poison the same solutions of iodine, which had succeeded against the venom of rattlesnakes, and at the sitting of Feb. 24, 1854, he presented to the Academy, in concert with M. Greene, a note entitled, *Iodine as an Antidote to Curare.*"

"This time, M. Brainard repeated his experiments before a commission, and they all appeared exact."

"In the experiments of M. Brainard, iodine seems to act by preventing absorption, and by destroying this *venom*."

"Such was the state of our knowledge when M. Reynoso undertook additional experiments."

"M. Reynoso mixed together 60 milligrammes of woorara and 4 decigrammes of iodine, dissolved in alcohol. This mixture, injected under the skin of a guinea pig, produced no effect."

The experiments of M. Reynoso fully confirmed mine. He, however, considered the alcoholic solution of iodine preferable to the watery, and further ascertained that bromine and chlorine were also antidotes to the woorari, a fact which their resemblance to iodine, and their more energetic action, would lead us to expect.

I was led to try the effect of iodine in poisoning by woorari, from having observed a great analogy between its action and that of the venom of serpents, and from the statements of M. Goudot, now confirmed by the reports of many travelers, that the active principle of that substance is the venom of serpents. This view is adopted by Bernard and Pelouze, as stated in their memoir on the subject, presented to the Academy of Sciences in 1850.

The first recommendation of iodine in snake bite, as far as I am informed, was made by Dr. James Whitmire, of Metamora, Illinois, whose communication was published in the N. W. Medical Journal for 1849, p. 396. He reports but one case treated by it, but states that he had used it in others.

It will be perceived that the merit of Prof. Bibron consists in having suggested the addition of corrosive sublimate to the iodine and bromine, already used by M. Reynoso and myself. About one thirtieth of a grain of the cor. sublimate would be contained in a dose of the Professor's mixture, supposing it to remain unchanged, which it is not likely to do. The reactions likely to take place between the three ingredients of this mixture will be readily understood, and need not be detailed here.

I am not able to say positively that the corrosive sublimate has been tried in cases of serpent bite; but it was, in all probability, tried by Fontana in viper bite without success, as he speaks of having tried every variety of acid, alkaline neutral and corrosive salt, without success.*

The publications in favor of Prof. Bibron's antidote, are open to this objection, that they ignore all the laborious, disagreeable, and even dangerous experiments by which conclusions

* *Traite sur le Venin de la Vipere.* Florence, vol. 2, p. 7, et seq.

favorable to the use of iodine were arrived at. They completely ignore all which had been done, not only with regard to the neutralization of the venom, but also with respect to preventing and delaying its absorption. The experiments of Barry, Blake, Pennock and Magendie, have shown that cups and ligatures upon members are capable of arresting the passage of poison into the blood, and thus arresting their action. I have shown, with regard to the two forms of venom above referred to, that they may not only be neutralized in the wound, but in the tissues.

No one at all aware of the terrible effects of the bite of the rattlesnake, would expect to combat them by 10 drops of Prof. Bibron's mixture taken internally. The results of trial thus far, have not done much to show its efficiency.

On the other hand, the iodine alone is, I believe, the remedy most relied on in a number of the western States. Independently of my own experiments, the evidence in its favor is very conclusive.

Dr. Whitmire says: "I have used it in bites of rattlesnake, viper and copper-head, on both man and beast, with complete success."

Mr. W. F. M. Arney, a well known citizen of Kansas, writes it is in general use there as an antidote, and that the bite of the serpent is thus deprived of its terrors.

In conclusion, I will add the directions already published for the treatment of the bite of venomous serpents.

1. Immediately apply cups to the part, or ligatures around the member bitten, so as to arrest absorption.

2. Wash away the venom from the wound.

3. Fill the wound, and if possible the tissues, with a solution of iodine, composed as follows:

R.	Iodine,	gr. x.
	Iodide potassium,	3 ss.
	Aq. Dist.	f ʒ i

D. To fill the tissues requires a cupping glass and a small syringe and trochar, such as I have described and use.*

* Essay on a New Method of Treating Serpent Bite and other Poisoned Wounds. Chicago, 1854.

In the present state of our knowledge, I should advise the use, internally, of alcohol in some form to the extent of intoxication. Alcohol assuredly is not an antidote; but the circulation in one laboring under its effects is retarded, absorption is slowly effected, and in this way it probably acts. The evidence in its favor is considerable, without being quite conclusive. We have, however, the analogous states of gangrene and various diseases attended with putrefaction, in which its value is well established, and perhaps its mode of action may be simply as an "antiseptic."

I add an interesting paper, by Dr. Whitmire, on this subject, recently published :

IODINE

An Antidote to the Venom of the Rattlesnake, (Crotalus), and in the Treatment of the Bite.

By JAMES S. WHITMIRE, OF METAMORA, ILL.

In the January number of the N. W. Medical and Surgical Journal, of 1849, I published an article in relation to the tinct. of iodine in the treatment of the bite of the rattlesnake; in which I argued that the venom produced debility of the capillary vessels, first by direct contact, and afterwards, by its absorption into the general circulation, it effected the entire system; and that the tinct., used as a paint upon the part, gave tone to the vessel by being absorbed; and that I consequently considered it a rational treatment. I suggested in the same article, that iodine was an antidote to the venom, and believed it to be so, on account of the extraordinary short time in which the system seemed to get rid of the poison, and ceased to be disturbed by its prostrating effects, especially when the remedy was used immediately, or even within six hours after the insertion of the venom. This was written after having treated many cases, during the years 1845, '46, '47, '48 and '49; and I had become thoroughly convinced, that the treatment of the bite of all venomous serpents or reptiles, by iodine, was preferable to any other then known to the profession. At that time, I had not satisfied myself, by actual experiments, that it was an antidote to the venom. Soon after this, however, Professor Brainard, of Rush Medical College, instituted a series of experiments, which were duly reported to the Illinois State Medical Society, at one of its subsequent sittings, in an ably written paper, read before the Society, proving, be-

yond a doubt, that iodine was a perfect antidote to the poison, completely destroying its effects on the animal economy, and therefore an indispensable agent in the treatment of the bite. Since his experiments, I have repeated them for my own satisfaction, with the same results. I have since then, again made some experiments of a different and interesting character, which, even though they prove of no practicable value, will, nevertheless, go far to establish a still mooted point, viz: whether the venom, when swallowed, will produce the same constitutional effects that are developed by it when injected into the cellular tissue by the bite. For this purpose I procured three of the largest, of the kind, that I could find on the prairie, and decapitated them, and proceeded to separate the poison-gland, sac that contains the secretion, and fang, all together, from under the orbit. By pressing the gland and sac between the thumb and finger, I could get from one to two drops from the canal in the fang, which I washed off in sweet milk, (I used six fangs in these experiments), and gave it to two young dogs, four months old, and three cats about the same age. To one dog and one cat, by means of a stomach tube, I gave each iii gr. iodine and vi gr. of iod. potass, rubbed up in water. In about two hours they both began to be restless and uneasy, and finally began to be languid and feverish, and would take no nourishment, but would take water when offered to them. In six hours after I repeated the dose; and in twenty-four hours they began to assume their wonted spirits, and never showed any distinguishable signs of poisoning. The other dog, and one cat, I did nothing for, and in about an hour they both began to show signs of illness. The cat mewed and gave out the most piteous cries, and seemed to be in the most excruciating agony: had fever and great thirst, drinking quantities of water, which it would eject from its stomach in twenty or thirty minutes. In five hours it began to swell and purge, so that, in fifteen hours the whole cellular tissue was infiltrated with serum. After this it had sanguinous discharges from the bowels; and at the end of twenty-four hours it died in convulsions.

The dog was held in very much the same condition, excepting when water was placed before him he would rise up on his fore legs and lap it greedily, and then sink back into the same languid condition. He vomited and seemed exceedingly prostrated for ten hours, and then remained stupid and whined, as if in pain, for twenty-four hours, after which he began to have bloody discharges from the bowels. He commenced swelling about the tenth hour, and at this time he began to have a thin sero-sanguinous fluid run from his eyes, and the vessels of the

conjunctiva were greatly engorged, and the cellular tissues under the conjunctiva was so infiltrated with bloody serum, that his eyes had more the appearance of balls of clotted blood than orbs of vision. He remained in this condition for about five days, taking no nourishment, but drinking a great quantity of water, though this was attended with great difficulty, on account of the swollen condition of his tongue. He now began to show signs of improvement, recovering his appetite slowly, his eyes losing their clotted appearance, and the swelling to cease; so that in six days Ponto was himself again.

To the last cat I gave diluted alcohol, every four hours, so soon as it began to show signs of illness, which commenced with the same languor, lassitude, pain and fever, as the others did. It wanted no food, but drank considerable water, being stupid all the time, either from the effects of the alcohol or the poison. It remained stupid and feverish for three days, after which it began to recover; and in about ten days I discharged my patient as cured, though it was still weak, and would have been the better of longer care.

My impression now is, in regard to the popular alcoholic treatment, that it does not act as an antidote to the venom, but merely stimulates the nervous system, through the great centers, and keeps the system above the depressing influence of the poison, giving nature a chance to get rid of the poison through its own resources.

These experiments have convinced me, that the venom, whether swallowed or injected into the cellular tissue, produces precisely the same results upon the animal economy, only the former acts more generally and the latter locally. Since I commenced the use of iodine, in the treatment of the bite of the rattlesnake, I have had every reason to be satisfied with its use: never, in the course of fourteen years' country practice, having been disappointed in its effects. During that time, I have treated 75 cases in man, which have comprised every grade of the effects of the poison that may be produced, reasonably, short of absolute dissolution, to within an hour of the infliction of the wound by the serpent. When called in a recent case, or even within fifteen hours of the bite, I now adopt Professor Brainard's plan; which is, to inject the cellular tissue, in and about the wound, with the tinct. of iodine, by means of a sharp pointed silver syringe, and then proceed to paint the swollen parts thoroughly with the tinct., and try to keep in advance of the swelling, from two to three inches; and in recent cases, this is all the treatment necessary to complete the cure.

If called after the constitutional effects of the poison have become developed, I paint the limb, and even the whole body, with the tinct., and give, internally, wine or brandy, with iod. potass. and chlor. potass., dissolved and largely diluted in water, till the urgent symptoms begin to subside, and then administer quinine and iron as a tonic, &c. I have treated two extreme cases, it having been three days from the time of the bite till I was called. In both cases there was fever and delirium, with extreme prostration, the wound black with infiltrated blood and vesicated patches on the limb, filled with a sero-sanguinous fluid, and hemorrhagic discharges from the bowels. For the latter, I prescribed solid opium and a turpentine emulsion, with creosote, so that my patient got one drop of the latter every four hours, at a dose. I gave them chlorate potash and iodide potass. dissolved and largely diluted with water, and brandy or wine, ad. libitum. I painted my patients nearly from head to foot with the tinct., and varied my treatment according to the urgencies that presented, till convalescence was established, which was in about ten days from the bite. Their convalescence were slow and tedious, but finally they recovered their usual health, strength and spirits.

XX. *Treatment of Empyema and other Abscesses, by Injections of Iodine.*

In the year 1857, I treated a case of empyema by repeated injections of a solution of iodine and iodide of potassium, one grain of the former and three of the latter to the ounce of distilled water. The solution was thrown into the pleural cavity through a catheter of the size No. 9, once a week, and sometimes oftener. The cure was effected in about four months. This case was of five years standing, erroneously reported in the N. W. Medical Journal for that year, (p. 477), as five months.

During the past winter, (1859-60), I have treated a case of empyema in the same manner, at the City Hospital. This was a case of six months duration, occasioned by a stab in the back behind the lower angle of the scapula. The case was under treatment for about eight weeks, and was injected twelve times with the solution, of various degrees of concentration, from one to three grains of the iodine to the ounce of the solution of the iodide of potassium.

The patient left the hospital much improved, but not cured. No dangerous or troublesome symptoms were at any time produced by the injections in either of these cases. In the *N. W. Med. Journal* for 1858, p. 95, Dr. David Prince reported a case in which he used two drachms of the tr. iodine (strong) as an injection into the suppurated pleura, five times in as many weeks, when a complete cure was effected. These cases show that this treatment is not, as is believed by some, dangerous. When unhealthy suppuration is going on, it is extremely useful in arresting it.

Some years since, the late Prof. Howard, of Columbus, recommended injections of iodine into abscesses as a means of curing them without continual discharge of pus. Long before the publication of Prof. H., I had tried this plan in some large abscesses, situated about the spine, without benefit. Since then, I have used it in some small scrofulous abscesses, extremely chronic, about the neck, by drawing off the pus with a trochar, allowing the solution of iodine to remain. Some of these have been thus converted into acute abscesses, were punctured and healed; one was so nearly cured after four injections, that the patient declined further treatment. In diffuse suppuration resulting from erysipelas, these injections are extremely useful. As early as 1847, I published a note on this subject, recommending at that time solutions of the sulphate of copper, four grains to the fluid ounce of water.

I have since preferred iodine, and have often resorted to it with advantage. In erysipelas, tending to suppuration, and gangrene, I have occasionally infiltrated the tissues with the weak iodine solution before suppuration occurred.

I have also used it several times in crushed members falling into gangrene, injecting it into the tissues as well as into open-ings. It acts as an antidote to the poisonous and putrid fluids and gasses which are generated and pass into the circulation. It has the chemical relations of chlorine without its activity, and is therefore better adapted as an antiseptic remedy, particularly when it is desired that it should pass into the blood.

XXI. *Treatment of Stricture of the Esophagus by applications of Nit. Silver in Solution.*

I have notes of ten cases of stricture of the esophagus, treated by myself, besides notices of several others, about which I have been consulted, but of which I could not learn the result.

Of these ten cases, two were at the cardiac orifice of the stomach. One was in an advanced stage, and the patient totally unable to swallow. In attempting to pass the stomach tube, the diaphragm was perforated, and the patient died from the effect of the injury and from inanition. In the other, also of many years continuance, in a young man, as he was able, after swallowing about a pint of semi-liquid food, to force it very quickly into the stomach, I advised against interference.

One was situated at the middle of the passage, and resulted, apparently, from malignant disease. I treated it by nit. silver, and it had been treated by others by bougies, but both were without success. The patient died, and no dissection made.

In seven of the cases, the obstruction was situated at the upper part of the esophagus. In one, it was occasioned by drinking a strong solution of potash by mistake. This produced extensive sloughing and cicatrix. In two, it was believed to have resulted from taking liquids too hot; and in four, no cause could be assigned. In all, the disease was old, and existing to a degree preventing the ingestion of solid food. In one, the case produced by potash, it often happened that not even a drop of liquid could be swallowed for a week and over. This patient is the son of a well known and eminent member of the bar of Chicago, and is therefore well known.

In all of these seven cases, very great relief was obtained from the use of the nitrate of silver in solution. In four, the cure seemed complete, after from three to five applications.

The method of using it, was by dipping the sponge with which a common probang is armed, in the solution of the strength of sixty grains to the ounce of water. This is then passed down to the stricture, (the sponge being first squeezed), pressed upon it for an instant and then withdrawn. The probang may be slightly curved. Repeated once a week, it was

often found that at the second or third application, the sponge passed readily through the stricture, which it would not do at first.

In the cases produced by burn, the relief was very nearly perfect. In that caused by potash, it was so great that solid food can be taken, if care be observed. Over three years have passed since the applications were made, and there has been no return of the difficulty of swallowing.

I have alluded to these cases here thus briefly, because, although the treatment by caustic is not new, this method of using it in solution of a strength to be entirely free from danger, seems but little known. Jameison and Chelius consider the use of caustic highly dangerous, which it would be, if used of a strength to destroy the stricture by forming an eschar.

XXII. *Treatment of Strictures of the Urethra by Forcible Rupture, External and Internal Incisions, and by Extrodution of the Bougie.*

The care of the United States Marine Hospital, at Chicago, has thrown into my hands every year a considerable number of cases of stricture of the urethra, which, from the peculiar circumstances in which sailors are placed, require to be treated promptly and effectually. Hence some cases, which in private practice and in patients of intelligence and leisure, might have been treated by gradual dilitation, have in sailors been treated by operation, principally by forcible rupture.

The practice followed may be briefly summed up as follows. After having treated any inflammatory affection as required, when present,—

1. Treat slight stricture by the occasional use of the bougie, which the patient may use occasionally himself.

2. In case of considerable stricture, situated at or near the orifice at the membranous portion of the urethra, or between the two, when a small instrument can be got to pass, use forcible rupture with metallic instruments, constructed of different sizes for the purpose, and capable of being opened with a screw to equal the size of a No. 14 sound. The patient is generally

placed under chloroform. I have treated some old and permanent strictures of the orifice, and a considerable number of the membranous and other parts of the urethra, in this way, without any serious accidents, and with a more perfect result than with any other method, except incision. A bougie should be introduced occasionally after the operation until a cure is effected.

3. For stricture resulting from chronic enlargement of the prostate, make two deep incisions by the instrument curved at the point, like those for crushing the stone, except that the middle blade is a cutting one. The instrument having been carried into the bladder, the point is turned down and drawn against the prostate, when the blade, being withdrawn, makes the incision of the requisite depth and extent, which should not be greater than that of the prostate body. Cases requiring this treatment are not frequent, and are the only ones requiring incision from within.

4. In old strictures attended with retention of urine abscess, rupture or disorganization of the urethra to a great extent, external incision is the operation best adapted. This is the old operation of J. L. Petit, performed long ago by Jameison, Alex. Stevens, and others in the country called in, France that of the *boutonnire* or batton hole, and differs in no respect from that called Symes' method. It consists in passing a sound down to the stricture, cutting down in the perineum to the end of the sound, searching with a director, for the passage through the stricture to the bladder, and when found incising the stricture freely. A catheter is then kept in the bladder during cicatrization. I have performed this operation only three times. One of the cases was from an ancient injury producing laceration of the urethra. The other two were old strictures with abscess and fistula. In each, the cure was perfect, the functions of the part being absolutely restored.

5. There are still some cases in which the disease is so extensive that simple incision is insufficient. They are those in which some surgeons have recommended extensive incisions, even to the entire length of the urethra. In a case of this kind, of eleven years, standing, attended with extensive

disorganization of the urethra, and retention of urine, which came under my care in 1848, I punctured the bladder above the pubis, and allowed the canula of the trochar to remain several weeks. When the urine was discharged through this channel, the swelling and suppuration existing about the track of the urethra subdued, and by passing a gum elastic bougie armed with a wire, and properly curved, through the fistulous canal where the puncture had been made, it readily was made to enter the vesical orifice of the urethra. Then by passing forward the bougie, (of which the wire was firmly fixed,) it passed the strictures from behind, forward, which it could not be made to pass from before backwards, and came so near the orifice that it was seized with small forceps and drawn fully into the urethra. It was allowed to remain for a week, when it was withdrawn and replaced by another, which then readily followed the canal from before, backward. To this process I give the name of Extrodution of the bougie. The details of the case may be found in the N. W. Medical Journal, for 1849, p. 21.

I have resorted to this plan in but one other case. It was that of a boy who fell astride of a board fence and ruptured the urethra. When I first saw him, extensive urinary infiltration had taken place, and the bladder was distended. I made openings in the perineum to give exit to the infiltrated urine, and punctured the bladder above the pubis to relieve the distiction, as the catheter could not be introduced. When the swelling had subsided, I passed the bougie from behind forward, as in the other case, but it would not pass the point of rupture. By inserting an instrument into the anterior part of the passage, the relations of the two parts was shown, and an incision, not very extensive, allowed the catheter to be placed in the bladder during cicatrization. The cure in this case was complete.

XXIII. *Trephining for Epilepsy caused by ancient Fractures of the Skull.*

The production of epilepsy by injuries of the head, is admitted by all writers on this disease. Surgeons, however, do not often see it as the result of recent fractures, for the reason

that it is generally when it occurs, a remote consequence. Patients admitted into hospitals with fractures of the cranium with depression, and treated without operation, are often discharged as cured at the end of a few weeks. They are heard of no more. But sooner or later epilepsy mania and dementia, in various degrees and combinations, are liable to supervene in some cases without the cause being suspected. I have been so often consulted about these cases, that I have been led to suspect that the directions given in most surgical books of authority in regard to trephining, is erroneous, and that in all cases of fracture of the skull with depression, (unless very slight), whether attended with wound of the scalp or symptoms of compression or not, it would be safer to raise up or remove the depressed bone. I have trephined six times for epilepsy, the remote effect of fracture with depression. Four of these were relieved, one recovered without cure, one died. This latter case has not been published, and is so interesting that I insert it here.

Case.—W. S. Miller, aged 29 years, entered the Chicago City Hospital Jan. 16, 1860. The history of his illness, furnished by his friends, was very important, and he was himself incapable of giving any. It appeared that sixteen years previously, he received a kick of a horse on the right temporal region, fracturing the skull and depressing the bone. No operation was performed at the time. After this, his character changed, and at the end of three years he had a severe epileptic paroxysm, followed by another in eighteen months; then another in six months, and gradually more frequently occurring, until at length they were repeated sometimes three times a day. About a year since, he began to show signs of insanity, and is at times very violent. He appears stupid and incapable of understanding or answering questions.

On examination, a depression was found to exist on the right side of the head, over the coronal suture. It was about two inches in length, one in breadth, and one-fourth of an inch in depth at some points. The patient's health was much impaired. He moved with difficulty, and trembled considerably.

Although a very hopeless case, I determined to trepan, and on the 18th Jan., while he was chloroformed, applied the crown of the trephine at two points, so as to cover the principal part of the depression. Before the chloroform was used, he had frequent spasms, and while under its effects, after the pieces of bone had been removed, he had a severe spasm. The respiration was performed spasmodically, and during inspiration, with a hissing sound. At this moment, the brain, which had been exposed (the dura mater adherent to the points of bone was opened), sunk so that the finger could readily be passed between the dura and the pia mater. On removing the first circle of bone, there was a considerable discharge of cerebro-spinal fluid.

The wound was dressed, and the patient placed in bed. For twenty-four hours he was quiet; took drinks readily. At the end of this time, he had chills and severe spasms, recurring at intervals during the day, with a tendency to somnolence. He died at four o'clock, A. M., on the 21st, sixty hours after operation.

Examination of the body was made to a limited extent, seven hours after death.

The pia mater was thickened, with considerable effusion beneath it. The left ventricle contained what appeared to be over an ounce of serum. The right ventricle was of still larger size; but it had been opened at the anterior *cornu*, and contained purulent matter: whether suppuration had taken place before the operation, or whether the rupture took place at the moment of the depression of the brain, and was followed by suppuration, it is difficult to decide with certainty; the latter supposition seems most probable.

We have notes of five cases in which this operation was performed for epilepsy, accompanied by more or less alteration of the mental faculties.

The first of these was that of a young man, John Ladrigan, cut upon the head at two points by an axe in the forests of Wisconsin. One wound extended from the median line, at the junction of the coronal and sagittal sutures, to the left side three

inches. The edge of the axe penetrated the substance of the brain deeply, portions of which escaped. The other cut, also on the left side, followed the line of junction of the parietal and occipital bones, and was as deep and as long as the other. At each a large piece of bone was partially separated, one edge passing upon the brain, and the other rising above the surface of the cranium.

This man stated that he had been left as in a hopeless condition by the physicians who were called to see him, but recovered with the wounds in the condition we have mentioned, the right superior and inferior members being affected with paralysis and contraction. He was also subject to very frequent and severe paroxysms of epilepsy, which occurred sometimes daily. He was operated upon before the class of the Rush Medical College.

The whole of the displaced fragment of the bone at the seat of the anterior wound was removed by three applications of the crown of the trephine. He recovered perfectly; had but one slight epileptic paroxysm afterwards, and gradually recovered considerable use of the members. No operation was performed on the posterior wound.

The second case was that of a young man from Kendall Co., Illinois. He received a blow above the ear, which fractured and depressed the skull without dividing the scalp. No operation was performed at the time, and he recovered, as was supposed. Six months afterwards he was seized with an epileptic fit. Three months afterwards, another occurred, and then one every month. One year after the injury, I removed the depressed portion with the trephine. He recovered, and the epileptic paroxysms recurred at lengthening intervals, until, at the last notice, six months had elapsed without a return.

The third case was that of a young man, kicked by a horse above the ear, fracture and depression being produced. Concussion and insensibility were the immediate results; after recovering from which, he remained insane, or nearly so.

About four weeks after the injury, he was admitted into the wards of the so-called Mercy Hospital, where I used the trephine. Removing the depressed portions of bone gave immediate relief.

The fourth case was a man of fifty years, who, eleven years previously, had a fracture with depression in the temporal region. This gave rise, for several years, to no perceptible inconvenience. At length, he began to be affected with giddiness and loss of consciousness, which, by degrees, became more frequent, until the severer forms of epilepsy were developed. The mind was also affected by dementia, to a degree which disqualified him for business. Removing the depressed pieces of bone gave him great relief, and one year after the operation he was steadily improving.

The fifth case was not so favorable. A lad, about sixteen years old, came for advice in regard to severe epileptic attacks, which had continued for several years. His friends stated that when an infant he had received a blow on the left superior part of the os frontis. On examining this part of the head, a depression was perceived, which, however, was soft and easily compressible. Although no bony surface could be felt at this point, yet the statement of friends of the patient, that the blow had produced a depression, induced me to apply the trephine upon its margin. It was found, however, that the bone at that point was entirely absorbed; that surrounding it was in a condition of hypertrophy, very spongy and vascular, and three times its natural thickness. The soft parts presented the appearance, in the point where the bone was deficient, of venous erectile tissue.

In this case no benefit appeared to result from the operation.

From the four preceding, the inference is, I think, deducible, that leaving depressed pieces of cranium when there is neither wound of the scalp nor symptoms of compression of the brain, as is advised by most surgical writers, is attended by dangers not usually suspected, and that it is better, in all such cases, to raise up the depressed portions at once.

REPORT ON SURGERY.

PART FIRST.

BY DANIEL BRAINARD, M. D., OF CHICAGO, ILL.

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